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Corresponding Author: Dr. Diana Sarfati, MBChB, MPH, PhD

Corresponding Author's Institution: University of Otago

First Author: Diana Sarfati, MBChB, MPH, PhD

Order of Authors: Diana Sarfati, MBChB, MPH, PhD; Rachel Dyer; Paula Vivili; Josephine Herman; Dingle Spence; Richard Sullivan; David Weller; Freddie Bray; Sarah Hill; Christopher Bates; Sunia Foliaki; Neal Palafox; Silvana Luciani; Alec Ekeroma; James Hospedales

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Abstract: Cancer is a leading cause of death in Small Island Developing States (SIDS), and is forecast to increase substantially over the coming years. Governments, regional agencies, and health services of SIDS face daunting challenges - including small and vulnerable economies, unequal distribution of resources, weak or fragmented health services, small population sizes making sustainable workforce and service development problematic, and specialised cancer services unavailable to many. Deliberate action is required to prevent massive human and economic costs relating to cancer. This paper highlights challenges and opportunities for SIDS, and identifies ways in which the international community can support efforts to improve cancer control in these settings. Our recommendations focus on funding and investment opportunities for cancer-related health system strengthening, sharing of technical assistance for research, surveillance, workforce and service development, and supporting SIDS with policies changes to reduce consumption of commodities that increase cancer risk.

***Reply to Reviewers Comments**

Dear Kat,

Please find our response to your Editorial comments:

1. Regarding reviewer 2, minor comment about inclusion of UHC and SDGs: we think it would be helpful to add a brief textbox about this to the paper; please add one and resubmit.

We have added a Textbox 2 to the paper addressing this issue as requested (as below).

Textbox 2: SIDS, the sustainable development goals and universal health coverage

The sustainable development goals (SDGs) include target 3.4, to reduce by a third premature mortality from NCDs through prevention and treatment. However, the potential role of NCD control in achieving SDGs (or not) extends well beyond this specific target.[29] The special case of SIDS in achieving and prioritising sustainable development was detailed in the SIDS accelerated modalities of action (SAMOA) pathway, which was developed at the third International Conference of SIDS in 2013, and resulted in a resolution adopted by the general Assembly of the U.N. in 2014.[30] The SAMOA pathway acknowledges the significance of health as foundational across SDGs, identifies the critical importance of international cooperation and partnerships in achieving them, and the central role of multisectoral strategies for both preventing and managing NCDs. This includes the strengthening of health systems and acceleration of universal health coverage implementation. SIDS vary substantially in terms of the extent to which they need to address the three inter-related elements of coverage as defined by the WHO[31]; ensuring financial protection by reducing reliance on out-of-pocket payments for patients, expanding the services covered ensuring that those selected are high priority, cost-effective and high quality services, and increasing the population covered. For example, in several Caribbean countries, out-of-pocket payments of cancer care remain high, while in most Pacific SIDS, a key issue is the relatively narrow scope of cancer treatment services available. Responding to these challenges, and the burden of cancer generally, requires integrated and coordinated policies and strategies within SIDS, with international partnerships and support to prevent and treat cancer. Progress in cancer control is absolutely integral to accelerating progress towards achieving SDGs within the challenging context facing SIDS.

2. As there are several individuals who you thank by name in the Acknowledgments, please note that we will need we need signed consent from all these named individuals agreeing to be mentioned by name in the paper. If you are unable to obtain these signed consents rapidly (as I suspect it could be difficult), I suggest we move this list of acknowledgments to a supplementary web appendix (in which case we do not need their signatures). If you opt for the latter, please provide a web appendix PDF file of the Acknowledgments (as you have done for papers in the series).

We have added the list of those acknowledged to an appendix as for the other papers in the series.

Best wishes
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Cancer control in Small Island Developing States: From local challenges to global action

Authors:

Professor Diana Sarfati (PhD) – corresponding author Head of Department, Public Health, University of Otago Wellington, PO Box 7343, Wellington, New Zealand; diana.sarfati@otago.ac.nz, +64 921 6042

Dr Rachel Dyer (MBChB) Registrar, Department of Public Health, University of Otago, Wellington, New Zealand

Dr Paula Vivili (MBBS) Public Health Division, Pacific Community (SPC), 95 Promenade Roger Laroque, BP D5, 98848 Noumea, New Caledonia

Dr Josephine (Aumea) Herman (PhD) Ministry of Health, PO Box 109, Rarotonga, Cook Islands

Dr Dingle Spence (MBBS) FRCR Hope Institute Hospital, Golding Ave, Kingston 7, Jamaica

Prof Richard Sullivan (PhD) School of Cancer and Pharmaceutical Sciences, King's College London, Great Maze Pond, London SE19RT, UK

Prof David Weller (PhD), James Mackenzie Professor of General Practice, Usher Institute of Population Health Sciences and Informatics, College of Medicine and Veterinary Medicine, University of Edinburgh, Teviot Place, Edinburgh EH8 9AG

Dr Freddie Bray (PhD) Cancer Surveillance Section, International Agency for Research on Cancer, 150 Cours Albert Thomas, 69008 Lyon, France

Dr Sarah Hill (PhD) Global Health Policy Unit, University of Edinburgh, 15A George Square, Edinburgh EH8 9LD

Christopher Bates (MPH) Nossal Institute for Global Health, Melbourne School of Population and Global Health, 333 Exhibition St, Melbourne, Victoria 3010 Australia

Dr Sunia Foliaki (PhD) Centre for Public Health Research, Massey University-Wellington Campus, PO Box 756, Wellington 6140, New Zealand

Professor Neal Palafox (MD) Pacific Regional Cancer Programs, Department of Family Medicine and Community Health, John A. Burns School of Medicine, University of Hawaii at Manoa, 651

Ilalo Street, MEB 224, Honolulu, Hawaii 96813 and Population Sciences in the Pacific Program (Cancer Prevention in the Pacific), University of Hawaii Cancer Center, Hawaii

Dr Silvana Luciani (MHSc) Department of Noncommunicable Diseases and Mental Health, Pan American Health Organization, 525 23rd St NW, Washington DC, USA.;

Professor Alec Ekeroma (PhD) Founding Professor National University of Samoa, PO Box 1622, Le Papaigalagala Campus, To'omatagi, Samoa and Head of Department, Obstetrics and Gynaecology, University of Otago, Wellington, New Zealand

Dr James Hospedales (MSc) Caribbean Public Health Agency, Kingston, Jamaica

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Abstract

Cancer is a leading cause of death in Small Island Developing States (SIDS), and is forecast to increase substantially over the coming years. Governments, regional agencies, and health services of SIDS face daunting challenges - including small and vulnerable economies, unequal distribution of resources, weak or fragmented health services, small population sizes making sustainable workforce and service development problematic, and specialised cancer services unavailable to many. Deliberate action is required to prevent massive human and economic costs relating to cancer. This paper highlights challenges and opportunities for SIDS, and identifies ways in which the international community can support efforts to improve cancer control in these settings. Our recommendations focus on funding and investment opportunities for cancer-related health system strengthening, sharing of technical assistance for research, surveillance, workforce and service development, and supporting SIDS with policies changes to reduce consumption of commodities that increase cancer risk.

Introduction

What are Small Island Developing States?

In 1992, the United Nations (UN) formally recognised a group of small island developing countries that faced 'specific social, economic and environmental vulnerabilities'.[1] These countries vary substantially in their development, size, cultures, languages, and history, but they also share certain features – including geographical isolation, fragile economies, ageing populations, and environments affected by global warming, making them vulnerable to natural disasters. Most have small populations and limited economies of scale, and are therefore heavily reliant on resources from larger neighbouring countries despite the high cost of transport, infrastructure, and communications.[1] Another common feature of these countries – closely linked with these characteristics – is their often under-developed health systems including limited workforce resource.

Whilst there are no specific criteria for being classed as a Small Island Developing State (SIDS), more than 50 countries (not all of them islands) are currently recognised as such (Table 1[2]). SIDS are located across three broad geographical areas: the Pacific; the Caribbean; and the Atlantic, Indian Ocean, Mediterranean, and South China Seas (AIMS). They are represented by a number of regional organisations, including the Caribbean Community,[3] the Pacific Community,[4] the Indian Ocean Commission,[5] and the Alliance of Small Island States (AOSIS)[6] which acts as a regional integration forum to address common challenges of economic, social, and sustainable human development.[6] Some regional organisations deal specifically with health issues: for example, the Caribbean Public

Health Agency (CARPHA) [7] has a focus on communicable diseases, disaster management, and the surveillance and prevention of non-communicable diseases (NCDs), while the Pan American Health Organization (PAHO)[8] operates as the regional office of the Americas for the World Health Organization (WHO), and the health agency of the Organisation of American States.

State of cancer control in SIDS

The unique and heterogeneous nature of SIDS is often overlooked within global, or low and middle-income country (LMIC) cancer control agendas. Their small size is associated with capacity issues in key aspects of cancer prevention and control, from functioning registries to access to radiotherapy. This paper aims to highlight specific challenges and opportunities for SIDS, and to identify ways in which the international community can support governments, academic institutions, and civil society efforts to improve cancer control in these settings.

Pacific and Caribbean regions

The first four papers in this series outlined the state of cancer control in the two main SIDS regions, the Pacific and Caribbean. Both regions share characteristics common to (most) SIDS – that is, small, geographically dispersed populations with limited financial and healthcare resources. Both struggle with adequate human resources for health and the impacts of global warming and natural disasters, with seven of the fifteen countries at highest risk of such impacts (Vanuatu, Tonga, Solomon Islands, Papua New Guinea, Fiji, Costa Rica and Kiribati) located in one of these two regions.[9] Both Pacific and Caribbean countries experience policy and intervention gaps along the cancer control continuum, although the scope and likely solutions to these problems differ. On the upside, the relatively small populations and strong cohesion across the two regions may offer opportunities for flexibility and innovation in collective approaches to cancer control.[10] On the international stage, the SIDS have frequently formed an effective lobby in advocating for greater attention to climate change and its impacts on their economies and environments.[11]

There is substantial heterogeneity both within and between these two regions. The Caribbean contains considerably more wealth, albeit distributed very unevenly.[12] Private health care plays a substantially bigger role in specialised cancer care, with private public partnerships representing a prominent approach to delivering such care (ref paper 3, Spence et al). In the Pacific, more limited cancer care is available on a highly centralised basis, due to very small populations and vast geographic distances. In the Caribbean, treatment requiring substantial capital or infrastructure (such as radiotherapy) is available in some countries, but frequently with challenges in maintaining quality, and accessible only to those able to pay. In the Pacific, specialist facilities are often absent altogether – meaning many treatments are available only to those who can afford to seek them in

neighbouring countries. Thus, both regions experience marked inequalities in access to cancer care, though the underlying mechanisms are somewhat different.

Textbox 1: Role of the Commonwealth in cancer control in SIDS

Many countries in both the Caribbean and Pacific belong to the Commonwealth – which provides a sense of connection and community in a shifting global landscape. Many island populations in the Caribbean identify more closely with the Commonwealth than with Latin America; while the Pacific includes eleven Commonwealth member states, all discrete island nations except Papua New Guinea. The Commonwealth's networks and convening power mean it is well-placed to contribute to cancer control efforts in these regions. It can provide representation at international fora (such as the UN), high-level advocacy on issues relevant to member countries, and has a track record for effecting change in areas of common concern such as climate change and antimicrobial resistance.

Consistent with the UN's third Sustainable Development Goal (SDG) and Political Declaration on NCDs, the Commonwealth has recognised NCDs as "a human development challenge which needs to be tackled urgently"[13] and has expressed commitment to raising awareness, mobilizing resources, and ensuring accessibility to the necessary prevention and treatment services.[14-16] In relation to cancer, the Commonwealth has led on some relevant initiatives. For example, the 'Cervical Cancer in the Commonwealth: Collective Action' programme has analysed the burden of cervical cancer in LMICs of the Commonwealth.[17]

Much more needs to be done, however, and this series of papers should catalyse further Commonwealth action on cancer. While still lacking a comprehensive cancer strategy, new initiatives such as the Commonwealth Innovation Hub have the potential to enhance and co-ordinate cancer control efforts among member states.[18] There have been calls to establish a Commonwealth Cancer Fund to "build up capacity in cancer control in the smaller and less economically advantaged Member States through skills training and multilateral aid."[19] In relation to the Caribbean and Pacific Islands, there is interest in Commonwealth support for Human Papilloma Virus (HPV) vaccination and cervical screening in its member states, and for improvements in the early detection, diagnosis, and treatment of childhood cancers.[20]

AIMS SIDS

Outside the Pacific and Caribbean regions, there are other UN-recognised SIDS collectively referred to as AIMS SIDS (table 2[21-25]). In addition, there are other island countries and territories not

explicitly mentioned in this paper which share similar experiences and challenges, and which similarly need support to develop more effective cancer control systems.

There is marked variation between the AIMS SIDS (table 2). At one end of the spectrum, Singapore and Bahrain are high-income countries (HICs) with national population-based cancer registries, operational cancer and NCD plans, and comprehensive cancer services providing specialised surgery, chemotherapy, radiotherapy, and palliative care. Conversely, advances in cancer surveillance, screening and prevention, diagnosis, and care have been limited in almost all other AIMS SIDS. For instance, the Comoros and Guinea-Bissau are among the poorest countries in the world and struggle to meet their populations' basic needs: sanitation, nutrition, transportation, and basic healthcare. Life expectancy remains low, and fragile health systems are burdened by multiple competing priorities including infectious diseases. Long periods of civil unrest in Guinea-Bissau have resulted in debilitated health systems, significant workforce shortages, and delayed progress in health infrastructure development. The double burden of lifestyle and infection related cancers is evident in many of these SIDS, with GLOBOCAN 2018 estimates showing the most common cancers are breast, cervical, and colorectum in women, and colorectum, prostate, liver, and lung in men (table 3[26]).

Outside of Bahrain and Singapore, cancer surveillance and prevention programmes are very limited. Mauritius and Seychelles are the only other AIMS countries (besides Bahrain and Singapore) to have population-based cancer registries, although pockets of cancer registration activity occur elsewhere (for example, Cape Verde has a hospital-based cancer registry). Despite the high burden of preventable cancers, none of these countries have established national screening programmes for cervical or breast cancers, and only two (Mauritius and Cape Verde) have operational standalone cancer plans in place. More positively, uptake of hepatitis B immunisation has been successful (>90% coverage) in most of these SIDS. A growing number of SIDS are incorporating Human Papilloma Virus (HPV) vaccination into their national schedules, with the Maldives recently approving HPV for roll-out to 9-15 year old girls.[27] As with other SIDS, many cancer prevention and educational campaigns in these countries are spearheaded by non-governmental organisations (NGOs) or patient groups.[28]

Diagnostic and treatment services are variable in all AIMS SIDS besides Bahrain and Singapore. The availability of histology and cytopathology services is very limited, and none have positron emission tomography (PET) scan capability. Chemotherapy is available in four countries, and Mauritius is the only AIMS SIDS (besides Bahrain and Singapore) with radiotherapy capabilities. Like other small islands globally, some AIMS SIDS have established pathways for accessing diagnostic and treatment services off-island by sending selected specimens or patients to neighbouring countries and/or

receiving visiting specialist services.[28] For instance, Cape Verdeans may be transferred to Portugal for radiotherapy and other oncological treatment not available in-country; patients from the Seychelles may seek comprehensive care in Sri Lanka, Reunion, or India; and Mauritius has an overseas treatment scheme for brain tumours.

Like the Pacific and Caribbean SIDS, innovations in cancer control and care are emerging in these SIDS. For example, the Comoros has partnered with the Felix Guyon University Hospital, Reunion, to provide a route for cancer diagnosis by sending tissue samples offshore, and with Mauritius and Madagascar to improve chemotherapy delivery on Comoros. Oncologists from the Portuguese-speaking SIDS (Cape Verde, São Tomé and Príncipe, and Guinea-Bissau) are collaborating to advance cancer control efforts via strategies such as improving access to cancer care, increasing cervical cancer screening and HPV vaccination, and developing educational, training and research pathways through their connection as PALOP (Países Africanos de Língua Oficial Portuguesa) countries.[28]

Textbox 2: SIDS, the sustainable development goals and universal health coverage

The sustainable development goals (SDGs) include target 3.4, to reduce by a third premature mortality from NCDs through prevention and treatment. However, the potential role of NCD control in achieving SDGs (or not) extends well beyond this specific target.[29] The special case of SIDS in achieving and prioritising sustainable development was detailed in the SIDS accelerated modalities of action (SAMOA) pathway, which was developed at the third International Conference of SIDS in 2013, and resulted in a resolution adopted by the general Assembly of the U.N. in 2014.[30] The SAMOA pathway acknowledges the significance of health as foundational across SDGs, identifies the critical importance of international cooperation and partnerships in achieving them, and the central role of multisectoral strategies for both preventing and managing NCDs. This includes the strengthening of health systems and acceleration of universal health coverage implementation. SIDS vary substantially in terms of the extent to which they need to address the three inter-related elements of coverage as defined by the WHO[31]; ensuring financial protection by reducing reliance on out-of-pocket payments for patients, expanding the services covered ensuring that those selected are high priority, cost-effective and high quality services, and increasing the population covered. For example, in several Caribbean countries, out-of-pocket payments of cancer care remain high, while in most Pacific SIDS, a key issue is the relatively narrow scope of cancer treatment services available. Responding to these challenges, and the burden of cancer generally, requires integrated and coordinated policies and strategies within SIDS, with international partnerships and support to prevent and treat cancer. Progress in cancer control is absolutely integral to accelerating progress towards achieving SDGs within the challenging context facing SIDS.

Common threads leading to recommendations

Many reports have summarised evidence on cancer control requirements within LMICs and developed recommendations for strengthening existing systems.[32-40] These have relevance for SIDS, although the unique circumstances of remote island states create distinctive challenges for cancer control. While acknowledging the diversity of this heterogeneous group, we highlight below the common themes in SIDS' experience of addressing the burden of cancer in their populations and implications for policy.

Monetary and Fiscal Policy for Cancer Control in SIDS

The economic case for investing in cancer control - from specific modalities such as radiotherapy and surgery through to population-based measures such as women's health initiatives, HPV vaccination and bowel cancer screening - is equally applicable to SIDS.[34,36,37] Good outcomes in cancer control are also highly sensitive to equity-centred fiscal policy, requiring significant public health expenditure (about 5-6% of GDP and at least $100USD per capita) and effective governance.[41] Where private investment and provision for cancer is present, it should be a minority partner that is well integrated into public care. This runs counter to the World Bank's historic approach to SIDS, which focuses on private sector-led growth in health and cancer care that necessarily requires stable, progressive economies. Yet SIDS have some of the most vulnerable economies in the world, facing serious constraints due to demographic and geographic characteristics. It is clear that investment in public health care is critical to maintain economic growth, even if this comes with larger budget deficits.[42] Cancer is a major cause of lost productivity due to premature mortality and morbidity, and effective public investment in cancer prevention and early diagnosis (including tobacco control, vaccination, and screening) will reduce the economic burden of cancer in transitioning economies.[43] Unfortunately, some SIDS are currently pursuing unaffordable programs focused on costly treatment of conditions affecting a small proportion of the population.[44] The failure to invest and tackle the causes of cancer – such as tobacco consumption - seriously undermines the economic sustainability of many SIDS (see section below on NCD prevention).

Growth in population-level drivers of cancer (such as tobacco and obesity) are expanding the burden of cancer in SIDS beyond what can be addressed via current fiscal policy. Given infection-related cancers are still high, the emergence of a "double disease burden" creates substantial economic challenges in supplying even a basic package of cancer care, which may be beyond what individual SIDS can achieve. Joint country models need to be examined, where geographically co-located SIDS create a single 'system' (discussed further below). It may be feasible and cost effective to provide

only basic community services in those SIDS with good access to specialist facilities in neighbouring HICs.[45] There is a need for more empirical evidence on the cost-effectiveness of such models and pathways. *Ad hoc* support though official development assistance (ODA) funding is not a long term solution;[46] rather, major ODA programs need to be created that specifically address cancer control in SIDS via public health and prevention initiatives. More widely, new tariffs and excise duties on unhealthy commodities need to be built into bilateral trade agreements in order to reduce the drivers of cancer and generate revenue for prevention and control activities, while still retaining SIDS' access to global markets which are crucial to sustainable economic growth.[47]

Regionalisation of cancer planning and services

A common practice among island nations is regional collaboration with external partners to facilitate the management of health programmes, including (in recent years) cancer control programmes. Such programmes typically involve an interweaving of *regionalization* (in which an external agency works in collaboration with a particular geographical region) and *regionalism* (in which individual countries within a geographical region come together for a common specific purpose, supported by bodies that express their collective identity and shape collective action).

The WHO often works in collaboration with a particular geographical 'region' in management of specific health care needs. In the Pacific, for example, this regionalisation has allowed prompt and affordable access by smaller nations to technical expertise for programme development. The Cancer Council of the Pacific Islands (CCPI), which operates in U.S.-affiliated Pacific islands (USAPIs), provides a well-established example of how locally-controlled regionalism can be initiated, with the CCPI using the University of Hawai'i as a gateway to funding and support, leading to a regionally-recognized cancer control plan and registry.[48,49] A further example of regionalisation is provided by the Pacific Regional Cancer Control Partnership (PRCP), which includes international partner agencies.[49] Managing cancer control in SIDS at a regional level means that collaborating SIDS can share resources and gain greater leverage for funding requests and global advocacy.

A regionalisation strategy for cancer prevention and control may be an effective way forward for SIDS in other regions. Regional efforts are most likely to be effective where they link countries that share a common language, historical and/or political affiliations in addressing a common need or goal such as national comprehensive cancer planning, or the development of regulation of medicines and health technologies.[50,51] Opportunities for such linkages may be found in existing government-led initiatives (e.g. the Caribbean Cooperation in Health and the Ministers of Health Caucuses of both the Pacific and Caribbean regions), in national and international cancer societies, in regional and local networks of NGOs (e.g. the Caribbean Cooperation in Health), in academia, or via

international organisations such as the International Agency for Research on Cancer (IARC) which has established cancer registry hubs in many regions.

The motivation for specific SIDS to be involved in regionalization or regionalism efforts will vary, depending on individual country resources, needs, and geopolitical support. High level regionalism requires support from health leaders in the relevant countries in order to identify the preferences, scope and nature of the collaborations. In order for such approaches to be effective, there needs to be sufficient political will (both across and within partner countries) to sustain collective action and outcome; mutually agreed institutional 'housing' and governance structures; and ongoing review processes. Equally important is that leadership and decision-making occur collaboratively, and reflect the needs and priorities of the constituent countries. Regional agencies, academic organisations, and non-Governmental Organisations are critical to provide resource for planning and working to deliver key actions according to agreed regional approaches.

Implementation policy that supports NCD control more generally

SIDS face particular challenges in developing coherent and effective approaches for cancer prevention. Key drivers of the growing cancer burden in these states include their dependence on and vulnerability to imported goods – some of which are health-promoting, but many of which are health-damaging.[52,53] In line with a broader development agenda, many SIDS have been encouraged to follow a programme of trade liberalisation as a means of attracting foreign investment and reducing the cost of imported goods.[52] The removal of trade barriers has been associated with increased consumption of tobacco, alcohol, and highly processed food and drinks, which collectively account for around 30% all cancers.[54,55]

Cancer prevention thus requires measures to reduce population consumption of unhealthy commodities, with the most effective strategies involving taxation, tariffs, and restrictions on marketing.[33] While SIDS experience particular challenges in balancing health and trade goals, there are some promising examples of successful efforts to protect island populations from unhealthy commodities.[56] The Cook Islands, Palau, and Tonga have all introduced tobacco taxes close to the WHO target (70% of the sale price)[57]; several Pacific and Caribbean countries have imposed significant taxes on alcohol and sweetened beverages;[58-60] and some Pacific countries have banned importation of specific unhealthy items such Tokelau's ban on the importation of sweetened fizzy drinks.[52] While there is ongoing work across the Caribbean to address these issues, there is scope to do more, however, particularly in relation to tobacco control in the Caribbean,[61] where several SIDS lack effective advertising bans and have tax levels below 25%.[57,62] Raising taxes on tobacco, alcohol,

and sugar-sweetened beverages has the potential to increase government revenue while also reducing the burden of NCDs.[33]

Developing cancer treatment services in SIDS

Workforce

Efforts to strengthen their health workforces will be key to enhancing cancer control within SIDS. As with many LMICs, SIDS struggle with limited workforce training, retention, professional support, and development opportunities, exacerbated by a lack of infractructure and equipment; movement of resources from public to private settings; and migration of specialised healthcare workers to HICs. In addition, the small population size of many SIDS limits the feasibility of specialised services, including cancer treatment centres, with models from HICs or even larger LMICs not applicable in these settings.[63] For example, a recent analysis noted than ocology stafffing is insufficient to meet the current demands of the poluation.[64] While the need for workforce development is recognised within the SDGs (target 3c), [65] SIDS are competing with other countries in a context of marked scarcity, with the global shortage of health workers estimated to reach 15 million by 2030.[66]

The challenges facing SIDS in developing a cancer workforce are daunting. Given their small and dispersed populations, highly specialised services are neither feasible nor affordable. For many SIDS, treating patients offshore is the only option – but health-related travel is expensive and complex and results in poor continuity of care, high out-of-pocket costs for patients and their families, and limited incentive to improve local services.[67]

Despite these challenges, there are significant opportunities for strengthening the cancer control workforce within SIDS. Health workforce development is a priority in both the Pacific and Caribbean regions, with efforts underway to improve workforce planning, education and training, as well as its regulation and monitoring.[68,69] Regional or subregional approaches can enhance the efficiency and the effectiveness of health workforce planning, and offer opportunities to share successful approaches. In the Pacific, for example, health workforce development has been a major agenda item in recent meetings of the Pacific Health Ministers;[70] and there are a number of collaborative groups and programmes that work to enhance training and continuing professional development, including the Pacific Regional Clinical Services and Workforce Improvement Program.[70] Significant challenges persist, however, including a lack of specific attention to cancer prevention and treatment in workforce development.[70] Similarly, in the Caribbean, several adhoc efforts for training

and building cancer workforce capacity have taken place, however a systematic process for cancer control workforce planning, development, and continuing education is still needed in the region.

Role of traditional healers

In most SIDS, traditional healers play an important role, but there is almost no research on either their impact on health or their potential to provide links between traditional and conventional medicine. Many people in SIDS will visit their traditional healer before seeking conventional medical care, and will continue to do so during treatments, and at the end of life. Traditional healers work with patients and families within their own communities. They use concepts and language that are familiar and congruent with understandings of health and disease within those communities. Engaging with these healers, and encouraging a complementary approach with conventional medicine, is likely to pay dividends. For example, more timely diagnosis and access to treatment may be achieved by training healers to recognise common cancer symptoms and refer patients to conventional services; while the involvement of traditional healers in conventional cancer care may improve its accessibility and provide patients with ongoing spiritual and mental support. Such innovative approaches would require identifying traditional healers who are prepared to work in partnership with conventional medicine, ongoing relationship building, consideration of the need for structural changes in the clinical setting to provide space for traditional healers, consideration of training needs of those healers, and attitudinal shifts for clinicians.[71]

Ensuring a reliable and affordable supply chain

A robust supply chain of essential medicines and supplies is essential to deliver effective and timely cancer diagnosis and treatment. Individually SIDS have little purchasing power, and little prospect for economies of scale. Centralised approaches to procurement and supply have been found to generally both reduce costs and improve supply including across countries.[51,72] One of the most successful examples is the Organisation of Eastern Caribbean States Pharmaceutical Procurement scheme (OECS-PPS) which was established in 1986.[73] The OECS-PPS operates as a monopsony purchaser of pharmaceuticals and medical supplies to nine small island countries. This approach has resulted in increased bargaining power and improved economies of scale, resulting in substantial reductions in drug prices, as well as improved supply chain and quality assurance processes, reductions in operational costs and better-informed selection and standardisation of pharmaceuticals.[74] The key success factors have previously been described in detail.[73] PAHO's Strategic Fund for Essential Medicines also offers a pooled procurement mechanism for medication

for participating countries in the Americas, including the Caribbean, resulting in improved pricing and purchasing, although it remains underutilised for cancer medications.[75]

Innovative approaches to delivering cancer care for SIDS

Innovative approaches to delivering cancer care are necessary in the context of many SIDS, where highly specialised models transplanted from HICs are unlikely to be useful. There is increasing recognition of the important role of primary care in cancer prevention, diagnosis, treatment, survivorship, and end of life care.[39] Arguably, this is particularly critical in the context of SIDS where secondary care services may be limited or even absent. Where it is available, specialised cancer care is typically limited to regional centres, and in many cases patients will have to leave the region altogether to access such care. This highlights the importance of enhancing what cancer care can be provided within specific islands. Nurses and allied health professionals are a valuable resource, potentially providing a range of cancer-related care – including prevention activites (such as smoking cessation advice), screening, treatment, palliative and survivorship care.[76,77] Supportive and palliative oncological care is provided by generalist medical practitioners in some SIDS; this could potentially be extended with input from colleagues in HICs. Such partnership arrangements exist for paediatric cancer in both the Pacific and Caribbean regions, and have resulted in subsantially improved outcomes for affected children (ref papers 2, Ekeroma et al and 4, Spence et al). These collaborations typically involve country-specific policies and procedures for communication and referral, as well as regular virtual and face-to-face meetings between clinicians based in SIDS with those based in HICs. A number of factors must be in place for such models to be effective and sustainable, including a commitment from the government and relevant healthcare workers that providing basic oncological services is a priority; training and professional support opportunities; and access to relevant infrastructure, policies and procedures, and equipment.

Online professional development, consultation, and mentoring programmes offer particular potential for SIDS, and are already supporting care in some contexts. For example, the Pacific Open Learning Health Net (POLHN) was established by the WHO and Pacific Ministers of Health in 2003, and provides accredited, freely accessible learning opportunities for health workers in the region on a broad range of topics.[78] Currently, the majority of these are not cancer-related, but such a platform would be ideally placed to increase training opportunities for cancer care workers.

Other technological solutions to support local healthcare workers include the use of telemedicine and point of care technologies. These collectively have great potential for improving cancer

detection, diagnosis and treatment, particularly in settings with limited infrastructure, as is the case in many SIDS.[79] Telemedicine can particularly support local clinicians with pathological and radiological diagnosis. [40] Point of care technologies have a range of uses, including HPV screen and treat programmes that have been positively evaluated in SIDS settings.[79-81] Tele-mentoring programmes such as the Extension for Community Healthcare Outcomes (ECHO) program support local clinicians to provide care of complex diseases with support and mentoring from specialists. [82] The ECHO program runs regular virtual 'clinics' held using commonly available videoconferencing technology, where local clinicians can present and discuss cases, and specialists, based in central hubs, can provide expert knowledge and experience. ECHO is increasingly being used across the cancer control continuum in LMICs settings - including in the Caribbean - to support comprehensive cancer plan development.[83] This approach could be expanded improve access to specialist cancer care in other SIDS.

Both telemedicine and tele-mentoring approaches require consistent, reliable, and affordable internet access, which may be problematic in some SIDS. Other potential barriers include high set-up costs, particularly for telepathology (which requires high-quality imaging), regulatory and legal requirements, and quality assurance processes for experts (such as pathologists) based in other countries.[40] However, the clear advantage of telemedicine is that health services in small countries may be able to access expertise in contexts where it is not feasible for them to maintain highly specialised services in-country.

International referrals

For many SIDS, it is not feasible to deliver comprehensive cancer treatment in-country – meaning patients must sometimes travel internationally for treatment. Travelling to receive treatment out-of-country can be complex and expensive, particularly in the context of time-sensitive care. Even where treatment costs are covered by Government, costs to patients for travel and accommodation can be catastrophic, or entirely out-of-reach for many patients. In addition, in order to ensure timely treatment, processes to facilitate treatment offshore must be efficient and streamlined. Given scarce resources, and high demand, this is not always the case. There is very little empirical research on the impact and costs of international referrals, nor on optimal models of such referrals. Critical questions remain unanswered on nearly every aspect of these referrals including the psychosocial, economic, and health impacts of international referrals on patients and their families, the impact of costs of these referrals on the referring country including their effect on the development of local services, identification of factors that make such referrals more or less successful, and the potential

role of the international community in assisting with funding or coordinating such referrals. Research in this area is urgently required.

Building surveillance and research infrastructure

Underpinning all the work required to strengthen cancer care within SIDS is the necessity for data systems to support cancer surveillance and inform locally-relevant priorities and policies. Evidently effective surveillance programmes including risk factor surveys, vital registration systems, and population-based cancer registries (PBCR), as well as clinical information systems are all esential to plan and evaluate interventions tailored to the local scale and profile of cancer. Cancer registration has a long history in SIDS, but has been historically challenged by limited health care infrastructure, including pathologist services. As a means to improve data quality and PBCR coverage in the Caribbean and Pacific Island regions, the IARC, with several partner organisations, have developed IARC Regional Hubs, as part of the Global Initiative for Cancer Registry Development (http://gicr.iarc.fr). The Regional Hubs provide the necessary technical guidance, training, advocacy, and research capacity-building to ensure the sustainable development of high-quality PBCR in these regions. A sustainable expansion of high-quality registries in the SIDS is thus feasible and underway, but given small population sizes in many states, regional approaches equally apply to surveillance, including PBCR. As with other programmes of local data collection, funding remains problematic for this initiative, despite the relatively small amounts required.

Local evidence to inform policy design and programme delivery in cancer control and prevention is badly needed in the SIDS. While there are many examples of productive partnerships between HICs and SIDS, research systems are often under-developed or non-existent in many SIDS.[84-86] The ongoing building of research capacity and infrastructure is essential for progressing SIDS' cancer control efforts as the health and cost burdens grow. This will be facilitated by continuing development of genuine collaborations between SIDS and HICs that address local research priorities, strengthen research infrastructure, and create impact by interpreting and implementing research findings in a way that is appropriate to local context.[87]

Start with the things that are likely to be easier, cheaper and quicker to implement with high impact

In seeking to manage cancer, SIDS face difficulties common to many LMICs while also experiencing some unique challenges. Cancer control in these settings is often seen as prohibitively expensive, and a lack of strategic prioritisation leads to missed opportunities for its inclusion in broader health systems strengthening agendas.[88] Yet much can be done to reduce suffering and premature death from cancer, even in resource-constrained settings.

The WHO recommends a stepwise approach to building a national cancer programme.[89] Alongside this, it encourages the prioritisation of effective tobacco control policies in order to reduce the most significant risk factor for cancer. As noted above, taxes on tobacco can also provide much-needed revenue to support health systems development.

Interventions based in primary and community settings offer particular promise in resource-poor settings. Such programmes can be effective even in the absence of specialist services or infrastructure, and offer alignment with broader development and universal health care goals.

Palliative care is explicitly recognised under the human right to health.[38] In LMICs, and even in SIDS classified as HICs, palliative care is an often neglected aspect of cancer care. This is particularly significant given that these countries are dealing with a high percentage of cancer patients with advanced disease for whom palliative care and pain relief are often the only option. Palliative care can be substantially enhanced via existing primary and community-based services. While many aspects of cancer care require costly and/or sophisticated treatment modalities, palliative care can be strengthened at relatively low cost by improving access, understanding, and coordination of care within existing systems.[38] Key priorities include efforts to increase the accessibility of essential medicines including immediate release and injectable morphine, simple equipment, and competency based human resources.[38] The essential package (of palliative care and pain relief health services) has been shown to be inexpensive and is applicable in countries at all stages of palliative care development.[38] Regional organisations such as the Caribbean Palliative Care Association play an important role in raising awareness and coordinating provision of palliative care, which is often misunderstood and/or neglected in existing health systems.[90]

Prevention of cervical cancer – a leading cause of cancer death in many SIDS – offers significant potential gains. HPV vaccination and cervical screening are cost-effective interventions recently highlighted as priorities by the Director General of WHO.[91] The international community can help SIDS strengthen their cervical cancer prevention efforts by supporting regional purchases of HPV vaccines and assisting countries in designing and implementing screening programmes tailored to their local context. For example, Papua New Guinea has introduced point-of-care screening using HPV-DNA testing; this offers a promising approach in SIDS countries where cytology is not available and approaches based on VIA (visualisation of the cervix after acetic acid) have had poor results.[81,92]

The role of the global cancer control community

Global efforts in cancer control have tended to focus on issues facing LMICs but not the particular vulnerabilities of SIDS. Smaller populations with inherent capacity issues, geographic isolation and environments increasingly affected by the consequences of global warning result in unique challenges. While, the sovereignty of states is paramount in the development of health policy, the global community has an important role in facilitating SIDS' own efforts to strengthen their cancer prevention and control systems. Key members of the global community include international organisations (such as WHO and its regional offices in the Americans and the Western Pacific), global alliances and networks (such as the Commonwealth, IARC, the European Union-African Caribbean Pacific partnership[93], and the Union for International Cancer Control[94]), and, importantly, HICs within these regions, many of which have close relationships with neighbouring SIDS. We have developed priority recommendations targeted at these groups, which are detailed in Textbox 3. These recommendations can and should be operationalised at both regional and global levels, and developed in partnerships between organisations within the global community and SIDS themselves (either as individual countries or as a collaborative group/ region).

Concluding statement

There are more than 50 heterogeneous SIDS globally facing major challenges in cancer control relating to their unique circumstances. While this paper cannot possibly capture all the complexity and nuance of those many nations, we hope that the work presented here, and in the other four papers in this series, has highlighted both the key gaps and the many opportunities to improve cancer outcomes in SIDS around the world.

Textbox 3: What can the global community do to help?

1. **International agencies or neighbouring HICs should assist SIDS in making the economic case for investing in cancer prevention and care - both for a domestic policy audience, and when applying for funding support from external sources**. This might include mapping of needs and services, evaluation of the economic costs of cancer, costs of cancer care resourcing, or cost-effectiveness evaluations of specific interventions (such as cervical cancer prevention).
2. **Overseas Development Aid should include cancer control**. Too often complex NCDs are excluded from directly allocated expenditures for health. ODA support for cancer control should be included in health system strengthening loans and grants, and should be linked to the phased development of national cancer control planning and operational plans for multi-country referrals.
3. **Where possible, take steps to facilitate SIDS' procurement of high-quality vaccines, and cancer technologies for surgery, pathology, imaging, radiotherapy (where appropriate), and systemic therapies (cancer medicines)**. For example, GAVI (the international vaccine alliance) has been instrumental in helping resource-poor countries gain access to affordable vaccines (including HPV vaccines), but could do more to focus on the specific needs of SIDS.
4. **Support workforce development and capacity by co-developing education and training programmes, partnership arrangements, tele-mentoring, and virtual clinics**. Several effective examples of these kinds of interventions exist, for example, the Pacific Island Project of the Royal Australasian College of Surgeons with local Pacific universities and the Pacific Island Surgeons Association have collaborated to increase the number of locally trained surgeons.(cite papers 2 , Ekeroma et al)
5. **Provide technical assistance and research support to SIDS led programs**. There is an urgent need to conduct health systems, economic, pathways and models of care research to inform policy, enhance quality of care and improve outcomes for cancer patients. This also requires capacity building in local data collection; investment in the IARC Caribbean and Pacific Cancer Registry Hubs through the Global Initiative for Cancer Registry Development (GICR) will significantly improve cancer surveillance and monitoring systems in SIDS.
6. **Support SIDS' efforts to reduce importation and consumption of commodities that increase population cancer risk** (tobacco, alcohol, unhealthy food products). In particular, HICs that trade with SIDS should respect these countries' efforts to protect their populations from unhealthy imported products rather than challenging such measures under trade

agreements in order to protect their export markets, as the U.S., Australia and New Zealand have all done in the past.[95,96]

7. **Provide technical and legal support for effective health governance and cancer prevention**, including how Ministries of Health and civil society organisations can strengthen public policies to reduce consumption and manage terms of engagement with commercial industries producing unhealthy commodities (tobacco, alcohol, and processed foods and beverages).

Search strategy and selection criteria

References were identified through searches of PubMed and grey literature with no earliest date specified and up until December 2018, with the search terms “Caribbean”, “Pacific”, “Small Island Developing States”, “Cancer”, “SIDS”, “regionalisation or regionalism”, “workforce”, “tobacco control”, “NCD control”, “surveillance”, “research” and “International referrals”. Grey literature from key international agencies was searched including from the WHO, World Bank and the UN, and individual country reports (for AIMS SIDS). Additional information was obtained from agendas and reports from key regional health leaders meetings (such as meetings of the Heads of Health, and Ministers of Health of the Pacific and Caribbean), and Government and non-Governmental websites We systematically collected specific information in cancer control activities from Ministry of Health officials and on-the-ground experts from the countries included in this series (see appendix p.1 for list of key informants). Only papers and reports published in English were reviewed. References were included on the basis of originality and relevance to the broad scope of this report.

Author contributions

DSa was the lead author, participated in the concept design, and led the writing of several sections. RD drafted the AIMS SIDS section and accompanying tables and figures. DSp drafted the palliative care section. RS drafted the section on monetary and fiscal policy. DW drafted section textbox 1. CB, SF, and NP drafted the section on regionalism. FB drafted the section on surveillance and research. SH led the section on NCD control. PV, JHe, JHo, SL, and AE contributed to content, participated in the editing and review of the paper. All co-authors reviewed and approved the final submitted version of the manuscript.

Declaration of interests

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Cancer control in Small Island Developing States: From local challenges to global action

Authors:

Professor Diana Sarfati (PhD) – corresponding author Head of Department, Public Health, University of Otago Wellington, PO Box 7343, Wellington, New Zealand; diana.sarfati@otago.ac.nz, +64 921 6042

Dr Rachel Dyer (MBChB) Registrar, Department of Public Health, University of Otago, Wellington, New Zealand

Dr Paula Vivili (MBBS) Public Health Division, Pacific Community (SPC), 95 Promenade Roger Laroque, BP D5, 98848 Noumea, New Caledonia

Dr Josephine (Aumea) Herman (PhD) Ministry of Health, PO Box 109, Rarotonga, Cook Islands

Dr Dingle Spence (MBBS) FRCR Hope Institute Hospital, Golding Ave, Kingston 7, Jamaica

Prof Richard Sullivan (PhD) School of Cancer and Pharmaceutical Sciences, King's College London, Great Maze Pond, London SE19RT, UK

Prof David Weller (PhD), James Mackenzie Professor of General Practice, Usher Institute of Population Health Sciences and Informatics, College of Medicine and Veterinary Medicine, University of Edinburgh, Teviot Place, Edinburgh EH8 9AG

Dr Freddie Bray (PhD) Cancer Surveillance Section, International Agency for Research on Cancer, 150 Cours Albert Thomas, 69008 Lyon, France

Dr Sarah Hill (PhD) Global Health Policy Unit, University of Edinburgh, 15A George Square, Edinburgh EH8 9LD

Christopher Bates (MPH) Nossal Institute for Global Health, Melbourne School of Population and Global Health, 333 Exhibition St, Melbourne, Victoria 3010 Australia

Dr Sunia Foliaki (PhD) Centre for Public Health Research, Massey University-Wellington Campus, PO Box 756, Wellington 6140, New Zealand

Professor Neal Palafox (MD) Pacific Regional Cancer Programs, Department of Family Medicine and Community Health, John A. Burns School of Medicine, University of Hawaii at Manoa, 651

Ilalo Street, MEB 224, Honolulu, Hawaii 96813 and Population Sciences in the Pacific Program (Cancer Prevention in the Pacific), University of Hawaii Cancer Center, Hawaii

Dr Silvana Luciani (MHSc) Department of Noncommunicable Diseases and Mental Health, Pan American Health Organization, 525 23rd St NW, Washington DC, USA.;

Professor Alec Ekeroma (PhD) Founding Professor National University of Samoa, PO Box 1622, Le Papaigalagala Campus, To'omatagi, Samoa and Head of Department, Obstetrics and Gynaecology, University of Otago, Wellington, New Zealand

Dr James Hospedales (MSc) Caribbean Public Health Agency, Kingston, Jamaica

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Abstract

Cancer is a leading cause of death in Small Island Developing States (SIDS), and is forecast to increase substantially over the coming years. Governments, regional agencies, and health services of SIDS face daunting challenges - including small and vulnerable economies, unequal distribution of resources, weak or fragmented health services, small population sizes making sustainable workforce and service development problematic, and specialised cancer services unavailable to many. Deliberate action is required to prevent massive human and economic costs relating to cancer. This paper highlights challenges and opportunities for SIDS, and identifies ways in which the international community can support efforts to improve cancer control in these settings. Our recommendations focus on funding and investment opportunities for cancer-related health system strengthening, sharing of technical assistance for research, surveillance, workforce and service development, and supporting SIDS with policies changes to reduce consumption of commodities that increase cancer risk.

Introduction

What are Small Island Developing States?

In 1992, the United Nations (UN) formally recognised a group of small island developing countries that faced 'specific social, economic and environmental vulnerabilities'.[1] These countries vary substantially in their development, size, cultures, languages, and history, but they also share certain features – including geographical isolation, fragile economies, ageing populations, and environments affected by global warming, making them vulnerable to natural disasters. Most have small populations and limited economies of scale, and are therefore heavily reliant on resources from larger neighbouring countries despite the high cost of transport, infrastructure, and communications.[1] Another common feature of these countries – closely linked with these characteristics – is their often under-developed health systems including limited workforce resource.

Whilst there are no specific criteria for being classed as a Small Island Developing State (SIDS), more than 50 countries (not all of them islands) are currently recognised as such (Table 1[2]). SIDS are located across three broad geographical areas: the Pacific; the Caribbean; and the Atlantic, Indian Ocean, Mediterranean, and South China Seas (AIMS). They are represented by a number of regional organisations, including the Caribbean Community,[3] the Pacific Community,[4] the Indian Ocean Commission,[5] and the Alliance of Small Island States (AOSIS)[6] which acts as a regional integration forum to address common challenges of economic, social, and sustainable human development.[6] Some regional organisations deal specifically with health issues: for example, the Caribbean Public

Health Agency (CARPHA) [7] has a focus on communicable diseases, disaster management, and the surveillance and prevention of non-communicable diseases (NCDs), while the Pan American Health Organization (PAHO)[8] operates as the regional office of the Americas for the World Health Organization (WHO), and the health agency of the Organisation of American States.

State of cancer control in SIDS

The unique and heterogeneous nature of SIDS is often overlooked within global, or low and middle-income country (LMIC) cancer control agendas. Their small size is associated with capacity issues in key aspects of cancer prevention and control, from functioning registries to access to radiotherapy. This paper aims to highlight specific challenges and opportunities for SIDS, and to identify ways in which the international community can support governments, academic institutions, and civil society efforts to improve cancer control in these settings.

Pacific and Caribbean regions

The first four papers in this series outlined the state of cancer control in the two main SIDS regions, the Pacific and Caribbean. Both regions share characteristics common to (most) SIDS – that is, small, geographically dispersed populations with limited financial and healthcare resources. Both struggle with adequate human resources for health and the impacts of global warming and natural disasters, with seven of the fifteen countries at highest risk of such impacts (Vanuatu, Tonga, Solomon Islands, Papua New Guinea, Fiji, Costa Rica and Kiribati) located in one of these two regions.[9] Both Pacific and Caribbean countries experience policy and intervention gaps along the cancer control continuum, although the scope and likely solutions to these problems differ. On the upside, the relatively small populations and strong cohesion across the two regions may offer opportunities for flexibility and innovation in collective approaches to cancer control.[10] On the international stage, the SIDS have frequently formed an effective lobby in advocating for greater attention to climate change and its impacts on their economies and environments.[11]

There is substantial heterogeneity both within and between these two regions. The Caribbean contains considerably more wealth, albeit distributed very unevenly.[12] Private health care plays a substantially bigger role in specialised cancer care, with private public partnerships representing a prominent approach to delivering such care (ref paper 3, Spence et al). In the Pacific, more limited cancer care is available on a highly centralised basis, due to very small populations and vast geographic distances. In the Caribbean, treatment requiring substantial capital or infrastructure (such as radiotherapy) is available in some countries, but frequently with challenges in maintaining quality, and accessible only to those able to pay. In the Pacific, specialist facilities are often absent altogether – meaning many treatments are available only to those who can afford to seek them in

neighbouring countries. Thus, both regions experience marked inequalities in access to cancer care, though the underlying mechanisms are somewhat different.

Textbox 1: Role of the Commonwealth in cancer control in SIDS

Many countries in both the Caribbean and Pacific belong to the Commonwealth – which provides a sense of connection and community in a shifting global landscape. Many island populations in the Caribbean identify more closely with the Commonwealth than with Latin America; while the Pacific includes eleven Commonwealth member states, all discrete island nations except Papua New Guinea. The Commonwealth's networks and convening power mean it is well-placed to contribute to cancer control efforts in these regions. It can provide representation at international fora (such as the UN), high-level advocacy on issues relevant to member countries, and has a track record for effecting change in areas of common concern such as climate change and antimicrobial resistance.

Consistent with the UN's third Sustainable Development Goal (SDG) and Political Declaration on NCDs, the Commonwealth has recognised NCDs as "a human development challenge which needs to be tackled urgently"[13] and has expressed commitment to raising awareness, mobilizing resources, and ensuring accessibility to the necessary prevention and treatment services.[14-16] In relation to cancer, the Commonwealth has led on some relevant initiatives. For example, the 'Cervical Cancer in the Commonwealth: Collective Action' programme has analysed the burden of cervical cancer in LMICs of the Commonwealth.[17]

Much more needs to be done, however, and this series of papers should catalyse further Commonwealth action on cancer. While still lacking a comprehensive cancer strategy, new initiatives such as the Commonwealth Innovation Hub have the potential to enhance and co-ordinate cancer control efforts among member states.[18] There have been calls to establish a Commonwealth Cancer Fund to "build up capacity in cancer control in the smaller and less economically advantaged Member States through skills training and multilateral aid."[19] In relation to the Caribbean and Pacific Islands, there is interest in Commonwealth support for Human Papilloma Virus (HPV) vaccination and cervical screening in its member states, and for improvements in the early detection, diagnosis, and treatment of childhood cancers.[20]

AIMS SIDS

Outside the Pacific and Caribbean regions, there are other UN-recognised SIDS collectively referred to as AIMS SIDS (table 2[21-25]). In addition, there are other island countries and territories not

explicitly mentioned in this paper which share similar experiences and challenges, and which similarly need support to develop more effective cancer control systems.

There is marked variation between the AIMS SIDS (table 2). At one end of the spectrum, Singapore and Bahrain are high-income countries (HICs) with national population-based cancer registries, operational cancer and NCD plans, and comprehensive cancer services providing specialised surgery, chemotherapy, radiotherapy, and palliative care. Conversely, advances in cancer surveillance, screening and prevention, diagnosis, and care have been limited in almost all other AIMS SIDS. For instance, the Comoros and Guinea-Bissau are among the poorest countries in the world and struggle to meet their populations' basic needs: sanitation, nutrition, transportation, and basic healthcare. Life expectancy remains low, and fragile health systems are burdened by multiple competing priorities including infectious diseases. Long periods of civil unrest in Guinea-Bissau have resulted in debilitated health systems, significant workforce shortages, and delayed progress in health infrastructure development. The double burden of lifestyle and infection related cancers is evident in many of these SIDS, with GLOBOCAN 2018 estimates showing the most common cancers are breast, cervical, and colorectum in women, and colorectum, prostate, liver, and lung in men (table 3[26]).

Outside of Bahrain and Singapore, cancer surveillance and prevention programmes are very limited. Mauritius and Seychelles are the only other AIMS countries (besides Bahrain and Singapore) to have population-based cancer registries, although pockets of cancer registration activity occur elsewhere (for example, Cape Verde has a hospital-based cancer registry). Despite the high burden of preventable cancers, none of these countries have established national screening programmes for cervical or breast cancers, and only two (Mauritius and Cape Verde) have operational standalone cancer plans in place. More positively, uptake of hepatitis B immunisation has been successful (>90% coverage) in most of these SIDS. A growing number of SIDS are incorporating Human Papilloma Virus (HPV) vaccination into their national schedules, with the Maldives recently approving HPV for roll-out to 9-15 year old girls.[27] As with other SIDS, many cancer prevention and educational campaigns in these countries are spearheaded by non-governmental organisations (NGOs) or patient groups.[28]

Diagnostic and treatment services are variable in all AIMS SIDS besides Bahrain and Singapore. The availability of histology and cytopathology services is very limited, and none have positron emission tomography (PET) scan capability. Chemotherapy is available in four countries, and Mauritius is the only AIMS SIDS (besides Bahrain and Singapore) with radiotherapy capabilities. Like other small islands globally, some AIMS SIDS have established pathways for accessing diagnostic and treatment services off-island by sending selected specimens or patients to neighbouring countries and/or

receiving visiting specialist services.[28] For instance, Cape Verdeans may be transferred to Portugal for radiotherapy and other oncological treatment not available in-country; patients from the Seychelles may seek comprehensive care in Sri Lanka, Reunion, or India; and Mauritius has an overseas treatment scheme for brain tumours.

Like the Pacific and Caribbean SIDS, innovations in cancer control and care are emerging in these SIDS. For example, the Comoros has partnered with the Felix Guyon University Hospital, Reunion, to provide a route for cancer diagnosis by sending tissue samples offshore, and with Mauritius and Madagascar to improve chemotherapy delivery on Comoros. Oncologists from the Portuguese-speaking SIDS (Cape Verde, São Tomé and Príncipe, and Guinea-Bissau) are collaborating to advance cancer control efforts via strategies such as improving access to cancer care, increasing cervical cancer screening and HPV vaccination, and developing educational, training and research pathways through their connection as PALOP (Países Africanos de Língua Oficial Portuguesa) countries.[28]

Textbox 2: SIDS, the sustainable development goals and universal health coverage

The sustainable development goals (SDGs) include target 3.4, to reduce by a third premature mortality from NCDs through prevention and treatment. However, the potential role of NCD control in achieving SDGs (or not) extends well beyond this specific target.[29] The special case of SIDS in achieving and prioritising sustainable development was detailed in the SIDS accelerated modalities of action (SAMOA) pathway, which was developed at the third International Conference of SIDS in 2013, and resulted in a resolution adopted by the general Assembly of the U.N. in 2014.[30] The SAMOA pathway acknowledges the significance of health as foundational across SDGs, identifies the critical importance of international cooperation and partnerships in achieving them, and the central role of multisectoral strategies for both preventing and managing NCDs. This includes the strengthening of health systems and acceleration of universal health coverage implementation. SIDS vary substantially in terms of the extent to which they need to address the three inter-related elements of coverage as defined by the WHO[31]; ensuring financial protection by reducing reliance on out-of-pocket payments for patients, expanding the services covered ensuring that those selected are high priority, cost-effective and high quality services, and increasing the population covered. For example, in several Caribbean countries, out-of-pocket payments of cancer care remain high, while in most Pacific SIDS, a key issue is the relatively narrow scope of cancer treatment services available. Responding to these challenges, and the burden of cancer generally, requires integrated and coordinated policies and strategies within SIDS, with international partnerships and support to prevent and treat cancer. Progress in cancer control is absolutely integral to accelerating progress towards achieving SDGs within the challenging context facing SIDS.

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Common threads leading to recommendations

Many reports have summarised evidence on cancer control requirements within LMICs and developed recommendations for strengthening existing systems.[32-40] These have relevance for SIDS, although the unique circumstances of remote island states create distinctive challenges for cancer control. While acknowledging the diversity of this heterogeneous group, we highlight below the common themes in SIDS' experience of addressing the burden of cancer in their populations and implications for policy.

Monetary and Fiscal Policy for Cancer Control in SIDS

The economic case for investing in cancer control - from specific modalities such as radiotherapy and surgery through to population-based measures such as women's health initiatives, HPV vaccination and bowel cancer screening - is equally applicable to SIDS.[34,36,37] Good outcomes in cancer control are also highly sensitive to equity-centred fiscal policy, requiring significant public health expenditure (about 5-6% of GDP and at least $100USD per capita) and effective governance.[41] Where private investment and provision for cancer is present, it should be a minority partner that is well integrated into public care. This runs counter to the World Bank's historic approach to SIDS, which focuses on private sector-led growth in health and cancer care that necessarily requires stable, progressive economies. Yet SIDS have some of the most vulnerable economies in the world, facing serious constraints due to demographic and geographic characteristics. It is clear that investment in public health care is critical to maintain economic growth, even if this comes with larger budget deficits.[42] Cancer is a major cause of lost productivity due to premature mortality and morbidity, and effective public investment in cancer prevention and early diagnosis (including tobacco control, vaccination, and screening) will reduce the economic burden of cancer in transitioning economies.[43] Unfortunately, some SIDS are currently pursuing unaffordable programs focused on costly treatment of conditions affecting a small proportion of the population.[44] The failure to invest and tackle the causes of cancer – such as tobacco consumption - seriously undermines the economic sustainability of many SIDS (see section below on NCD prevention).

Growth in population-level drivers of cancer (such as tobacco and obesity) are expanding the burden of cancer in SIDS beyond what can be addressed via current fiscal policy. Given infection-related cancers are still high, the emergence of a "double disease burden" creates substantial economic challenges in supplying even a basic package of cancer care, which may be beyond what individual SIDS can achieve. Joint country models need to be examined, where geographically co-located SIDS create a single 'system' (discussed further below). It may be feasible and cost effective to provide

only basic community services in those SIDS with good access to specialist facilities in neighbouring HICs.[45] There is a need for more empirical evidence on the cost-effectiveness of such models and pathways. *Ad hoc* support though official development assistance (ODA) funding is not a long term solution;[46] rather, major ODA programs need to be created that specifically address cancer control in SIDS via public health and prevention initiatives. More widely, new tariffs and excise duties on unhealthy commodities need to be built into bilateral trade agreements in order to reduce the drivers of cancer and generate revenue for prevention and control activities, while still retaining SIDS' access to global markets which are crucial to sustainable economic growth.[47]

Regionalisation of cancer planning and services

A common practice among island nations is regional collaboration with external partners to facilitate the management of health programmes, including (in recent years) cancer control programmes. Such programmes typically involve an interweaving of *regionalization* (in which an external agency works in collaboration with a particular geographical region) and *regionalism* (in which individual countries within a geographical region come together for a common specific purpose, supported by bodies that express their collective identity and shape collective action).

The WHO often works in collaboration with a particular geographical 'region' in management of specific health care needs. In the Pacific, for example, this regionalisation has allowed prompt and affordable access by smaller nations to technical expertise for programme development. The Cancer Council of the Pacific Islands (CCPI), which operates in U.S.-affiliated Pacific islands (USAPIs), provides a well-established example of how locally-controlled regionalism can be initiated, with the CCPI using the University of Hawai'i as a gateway to funding and support, leading to a regionally-recognized cancer control plan and registry.[48,49] A further example of regionalisation is provided by the Pacific Regional Cancer Control Partnership (PRCP), which includes international partner agencies.[49] Managing cancer control in SIDS at a regional level means that collaborating SIDS can share resources and gain greater leverage for funding requests and global advocacy.

A regionalisation strategy for cancer prevention and control may be an effective way forward for SIDS in other regions. Regional efforts are most likely to be effective where they link countries that share a common language, historical and/or political affiliations in addressing a common need or goal such as national comprehensive cancer planning, or the development of regulation of medicines and health technologies.[50,51] Opportunities for such linkages may be found in existing government-led initiatives (e.g. the Caribbean Cooperation in Health and the Ministers of Health Caucuses of both the Pacific and Caribbean regions), in national and international cancer societies, in regional and local networks of NGOs (e.g. the Caribbean Cooperation in Health), in academia, or via

international organisations such as the International Agency for Research on Cancer (IARC) which has established cancer registry hubs in many regions.

The motivation for specific SIDS to be involved in regionalization or regionalism efforts will vary, depending on individual country resources, needs, and geopolitical support. High level regionalism requires support from health leaders in the relevant countries in order to identify the preferences, scope and nature of the collaborations. In order for such approaches to be effective, there needs to be sufficient political will (both across and within partner countries) to sustain collective action and outcome; mutually agreed institutional 'housing' and governance structures; and ongoing review processes. Equally important is that leadership and decision-making occur collaboratively, and reflect the needs and priorities of the constituent countries. Regional agencies, academic organisations, and non-Governmental Organisations are critical to provide resource for planning and working to deliver key actions according to agreed regional approaches.

Implementation policy that supports NCD control more generally

SIDS face particular challenges in developing coherent and effective approaches for cancer prevention. Key drivers of the growing cancer burden in these states include their dependence on and vulnerability to imported goods – some of which are health-promoting, but many of which are health-damaging.[52,53] In line with a broader development agenda, many SIDS have been encouraged to follow a programme of trade liberalisation as a means of attracting foreign investment and reducing the cost of imported goods.[52] The removal of trade barriers has been associated with increased consumption of tobacco, alcohol, and highly processed food and drinks, which collectively account for around 30% all cancers.[54,55]

Cancer prevention thus requires measures to reduce population consumption of unhealthy commodities, with the most effective strategies involving taxation, tariffs, and restrictions on marketing.[33] While SIDS experience particular challenges in balancing health and trade goals, there are some promising examples of successful efforts to protect island populations from unhealthy commodities.[56] The Cook Islands, Palau, and Tonga have all introduced tobacco taxes close to the WHO target (70% of the sale price)[57]; several Pacific and Caribbean countries have imposed significant taxes on alcohol and sweetened beverages;[58-60] and some Pacific countries have banned importation of specific unhealthy items such Tokelau's ban on the importation of sweetened fizzy drinks.[52] While there is ongoing work across the Caribbean to address these issues, there is scope to do more, however, particularly in relation to tobacco control in the Caribbean,[61] where several SIDS lack effective advertising bans and have tax levels below 25%.[57,62] Raising taxes on tobacco, alcohol,

and sugar-sweetened beverages has the potential to increase government revenue while also reducing the burden of NCDs.[33]

Developing cancer treatment services in SIDS

Workforce

Efforts to strengthen their health workforces will be key to enhancing cancer control within SIDS. As with many LMICs, SIDS struggle with limited workforce training, retention, professional support, and development opportunities, exacerbated by a lack of infractructure and equipment; movement of resources from public to private settings; and migration of specialised healthcare workers to HICs. In addition, the small population size of many SIDS limits the feasibility of specialised services, including cancer treatment centres, with models from HICs or even larger LMICs not applicable in these settings.[63] For example, a recent analysis noted than ocology stafffing is insufficient to meet the current demands of the poluation.[64] While the need for workforce development is recognised within the SDGs (target 3c), [65] SIDS are competing with other countries in a context of marked scarcity, with the global shortage of health workers estimated to reach 15 million by 2030.[66]

The challenges facing SIDS in developing a cancer workforce are daunting. Given their small and dispersed populations, highly specialised services are neither feasible nor affordable. For many SIDS, treating patients offshore is the only option – but health-related travel is expensive and complex and results in poor continuity of care, high out-of-pocket costs for patients and their families, and limited incentive to improve local services.[67]

Despite these challenges, there are significant opportunities for strengthening the cancer control workforce within SIDS. Health workforce development is a priority in both the Pacific and Caribbean regions, with efforts underway to improve workforce planning, education and training, as well as its regulation and monitoring.[68,69] Regional or subregional approaches can enhance the efficiency and the effectiveness of health workforce planning, and offer opportunities to share successful approaches. In the Pacific, for example, health workforce development has been a major agenda item in recent meetings of the Pacific Health Ministers;[70] and there are a number of collaborative groups and programmes that work to enhance training and continuing professional development, including the Pacific Regional Clinical Services and Workforce Improvement Program.[70] Significant challenges persist, however, including a lack of specific attention to cancer prevention and treatment in workforce development.[70] Similarly, in the Caribbean, several adhoc efforts for training

and building cancer workforce capacity have taken place, however a systematic process for cancer control workforce planning, development, and continuing education is still needed in the region.

Role of traditional healers

In most SIDS, traditional healers play an important role, but there is almost no research on either their impact on health or their potential to provide links between traditional and conventional medicine. Many people in SIDS will visit their traditional healer before seeking conventional medical care, and will continue to do so during treatments, and at the end of life. Traditional healers work with patients and families within their own communities. They use concepts and language that are familiar and congruent with understandings of health and disease within those communities. Engaging with these healers, and encouraging a complementary approach with conventional medicine, is likely to pay dividends. For example, more timely diagnosis and access to treatment may be achieved by training healers to recognise common cancer symptoms and refer patients to conventional services; while the involvement of traditional healers in conventional cancer care may improve its accessibility and provide patients with ongoing spiritual and mental support. Such innovative approaches would require identifying traditional healers who are prepared to work in partnership with conventional medicine, ongoing relationship building, consideration of the need for structural changes in the clinical setting to provide space for traditional healers, consideration of training needs of those healers, and attitudinal shifts for clinicians.[71]

Ensuring a reliable and affordable supply chain

A robust supply chain of essential medicines and supplies is essential to deliver effective and timely cancer diagnosis and treatment. Individually SIDS have little purchasing power, and little prospect for economies of scale. Centralised approaches to procurement and supply have been found to generally both reduce costs and improve supply including across countries.[51,72] One of the most successful examples is the Organisation of Eastern Caribbean States Pharmaceutical Procurement scheme (OECS-PPS) which was established in 1986.[73] The OECS-PPS operates as a monopsony purchaser of pharmaceuticals and medical supplies to nine small island countries. This approach has resulted in increased bargaining power and improved economies of scale, resulting in substantial reductions in drug prices, as well as improved supply chain and quality assurance processes, reductions in operational costs and better-informed selection and standardisation of pharmaceuticals.[74] The key success factors have previously been described in detail.[73] PAHO's Strategic Fund for Essential Medicines also offers a pooled procurement mechanism for medication

for participating countries in the Americas, including the Caribbean, resulting in improved pricing and purchasing, although it remains underutilised for cancer medications.[75]

Innovative approaches to delivering cancer care for SIDS

Innovative approaches to delivering cancer care are necessary in the context of many SIDS, where highly specialised models transplanted from HICs are unlikely to be useful. There is increasing recognition of the important role of primary care in cancer prevention, diagnosis, treatment, survivorship, and end of life care.[39] Arguably, this is particularly critical in the context of SIDS where secondary care services may be limited or even absent. Where it is available, specialised cancer care is typically limited to regional centres, and in many cases patients will have to leave the region altogether to access such care. This highlights the importance of enhancing what cancer care can be provided within specific islands. Nurses and allied health professionals are a valuable resource, potentially providing a range of cancer-related care – including prevention activites (such as smoking cessation advice), screening, treatment, palliative and survivorship care.[76,77] Supportive and palliative oncological care is provided by generalist medical practitioners in some SIDS; this could potentially be extended with input from colleagues in HICs. Such partnership arrangements exist for paediatric cancer in both the Pacific and Caribbean regions, and have resulted in subsantially improved outcomes for affected children (ref papers 2, Ekeroma et al and 4, Spence et al). These collaborations typically involve country-specific policies and procedures for communication and referral, as well as regular virtual and face-to-face meetings between clinicians based in SIDS with those based in HICs. A number of factors must be in place for such models to be effective and sustainable, including a commitment from the government and relevant healthcare workers that providing basic oncological services is a priority; training and professional support opportunities; and access to relevant infrastructure, policies and procedures, and equipment.

Online professional development, consultation, and mentoring programmes offer particular potential for SIDS, and are already supporting care in some contexts. For example, the Pacific Open Learning Health Net (POLHN) was established by the WHO and Pacific Ministers of Health in 2003, and provides accredited, freely accessible learning opportunities for health workers in the region on a broad range of topics.[78] Currently, the majority of these are not cancer-related, but such a platform would be ideally placed to increase training opportunities for cancer care workers.

Other technological solutions to support local healthcare workers include the use of telemedicine and point of care technologies. These collectively have great potential for improving cancer

detection, diagnosis and treatment, particularly in settings with limited infrastructure, as is the case in many SIDS.[79] Telemedicine can particularly support local clinicians with pathological and radiological diagnosis. [40] Point of care technologies have a range of uses, including HPV screen and treat programmes that have been positively evaluated in SIDS settings.[79-81] Tele-mentoring programmes such as the Extension for Community Healthcare Outcomes (ECHO) program support local clinicians to provide care of complex diseases with support and mentoring from specialists. [82] The ECHO program runs regular virtual 'clinics' held using commonly available videoconferencing technology, where local clinicians can present and discuss cases, and specialists, based in central hubs, can provide expert knowledge and experience. ECHO is increasingly being used across the cancer control continuum in LMICs settings - including in the Caribbean - to support comprehensive cancer plan development.[83] This approach could be expanded improve access to specialist cancer care in other SIDS.

Both telemedicine and tele-mentoring approaches require consistent, reliable, and affordable internet access, which may be problematic in some SIDS. Other potential barriers include high set-up costs, particularly for telepathology (which requires high-quality imaging), regulatory and legal requirements, and quality assurance processes for experts (such as pathologists) based in other countries.[40] However, the clear advantage of telemedicine is that health services in small countries may be able to access expertise in contexts where it is not feasible for them to maintain highly specialised services in-country.

International referrals

For many SIDS, it is not feasible to deliver comprehensive cancer treatment in-country – meaning patients must sometimes travel internationally for treatment. Travelling to receive treatment out-of-country can be complex and expensive, particularly in the context of time-sensitive care. Even where treatment costs are covered by Government, costs to patients for travel and accommodation can be catastrophic, or entirely out-of-reach for many patients. In addition, in order to ensure timely treatment, processes to facilitate treatment offshore must be efficient and streamlined. Given scarce resources, and high demand, this is not always the case. There is very little empirical research on the impact and costs of international referrals, nor on optimal models of such referrals. Critical questions remain unanswered on nearly every aspect of these referrals including the psychosocial, economic, and health impacts of international referrals on patients and their families, the impact of costs of these referrals on the referring country including their effect on the development of local services, identification of factors that make such referrals more or less successful, and the potential

role of the international community in assisting with funding or coordinating such referrals. Research in this area is urgently required.

Building surveillance and research infrastructure

Underpinning all the work required to strengthen cancer care within SIDS is the necessity for data systems to support cancer surveillance and inform locally-relevant priorities and policies. Evidently effective surveillance programmes including risk factor surveys, vital registration systems, and population-based cancer registries (PBCR), as well as clinical information systems are all esential to plan and evaluate interventions tailored to the local scale and profile of cancer. Cancer registration has a long history in SIDS, but has been historically challenged by limited health care infrastructure, including pathologist services. As a means to improve data quality and PBCR coverage in the Caribbean and Pacific Island regions, the IARC, with several partner organisations, have developed IARC Regional Hubs, as part of the Global Initiative for Cancer Registry Development (http://gicr.iarc.fr). The Regional Hubs provide the necessary technical guidance, training, advocacy, and research capacity-building to ensure the sustainable development of high-quality PBCR in these regions. A sustainable expansion of high-quality registries in the SIDS is thus feasible and underway, but given small population sizes in many states, regional approaches equally apply to surveillance, including PBCR. As with other programmes of local data collection, funding remains problematic for this initiative, despite the relatively small amounts required.

Local evidence to inform policy design and programme delivery in cancer control and prevention is badly needed in the SIDS. While there are many examples of productive partnerships between HICs and SIDS, research systems are often under-developed or non-existent in many SIDS.[84-86] The ongoing building of research capacity and infrastructure is essential for progressing SIDS' cancer control efforts as the health and cost burdens grow. This will be facilitated by continuing development of genuine collaborations between SIDS and HICs that address local research priorities, strengthen research infrastructure, and create impact by interpreting and implementing research findings in a way that is appropriate to local context.[87]

Start with the things that are likely to be easier, cheaper and quicker to implement with high impact

In seeking to manage cancer, SIDS face difficulties common to many LMICs while also experiencing some unique challenges. Cancer control in these settings is often seen as prohibitively expensive, and a lack of strategic prioritisation leads to missed opportunities for its inclusion in broader health systems strengthening agendas.[88] Yet much can be done to reduce suffering and premature death from cancer, even in resource-constrained settings.

The WHO recommends a stepwise approach to building a national cancer programme.[89] Alongside this, it encourages the prioritisation of effective tobacco control policies in order to reduce the most significant risk factor for cancer. As noted above, taxes on tobacco can also provide much-needed revenue to support health systems development.

Interventions based in primary and community settings offer particular promise in resource-poor settings. Such programmes can be effective even in the absence of specialist services or infrastructure, and offer alignment with broader development and universal health care goals.

Palliative care is explicitly recognised under the human right to health.[38] In LMICs, and even in SIDS classified as HICs, palliative care is an often neglected aspect of cancer care. This is particularly significant given that these countries are dealing with a high percentage of cancer patients with advanced disease for whom palliative care and pain relief are often the only option. Palliative care can be substantially enhanced via existing primary and community-based services. While many aspects of cancer care require costly and/or sophisticated treatment modalities, palliative care can be strengthened at relatively low cost by improving access, understanding, and coordination of care within existing systems.[38] Key priorities include efforts to increase the accessibility of essential medicines including immediate release and injectable morphine, simple equipment, and competency based human resources.[38] The essential package (of palliative care and pain relief health services) has been shown to be inexpensive and is applicable in countries at all stages of palliative care development.[38] Regional organisations such as the Caribbean Palliative Care Association play an important role in raising awareness and coordinating provision of palliative care, which is often misunderstood and/or neglected in existing health systems.[90]

Prevention of cervical cancer – a leading cause of cancer death in many SIDS – offers significant potential gains. HPV vaccination and cervical screening are cost-effective interventions recently highlighted as priorities by the Director General of WHO.[91] The international community can help SIDS strengthen their cervical cancer prevention efforts by supporting regional purchases of HPV vaccines and assisting countries in designing and implementing screening programmes tailored to their local context. For example, Papua New Guinea has introduced point-of-care screening using HPV-DNA testing; this offers a promising approach in SIDS countries where cytology is not available and approaches based on VIA (visualisation of the cervix after acetic acid) have had poor results.[81,92]

The role of the global cancer control community

Global efforts in cancer control have tended to focus on issues facing LMICs but not the particular vulnerabilities of SIDS. Smaller populations with inherent capacity issues, geographic isolation and environments increasingly affected by the consequences of global warning result in unique challenges. While, the sovereignty of states is paramount in the development of health policy, the global community has an important role in facilitating SIDS' own efforts to strengthen their cancer prevention and control systems. Key members of the global community include international organisations (such as WHO and its regional offices in the Americans and the Western Pacific), global alliances and networks (such as the Commonwealth, IARC, the European Union-African Caribbean Pacific partnership[93], and the Union for International Cancer Control[94]), and, importantly, HICs within these regions, many of which have close relationships with neighbouring SIDS. We have developed priority recommendations targeted at these groups, which are detailed in Textbox 3~~2~~. These recommendations can and should be operationalised at both regional and global levels, and developed in partnerships between organisations within the global community and SIDS themselves (either as individual countries or as a collaborative group/ region).

Concluding statement

There are more than 50 heterogeneous SIDS globally facing major challenges in cancer control relating to their unique circumstances. While this paper cannot possibly capture all the complexity and nuance of those many nations, we hope that the work presented here, and in the other four papers in this series, has highlighted both the key gaps and the many opportunities to improve cancer outcomes in SIDS around the world.

Textbox 32: What can the global community do to help?

1. **International agencies or neighbouring HICs should assist SIDS in making the economic case for investing in cancer prevention and care - both for a domestic policy audience, and when applying for funding support from external sources**. This might include mapping of needs and services, evaluation of the economic costs of cancer, costs of cancer care resourcing, or cost-effectiveness evaluations of specific interventions (such as cervical cancer prevention).
2. **Overseas Development Aid should include cancer control**. Too often complex NCDs are excluded from directly allocated expenditures for health. ODA support for cancer control should be included in health system strengthening loans and grants, and should be linked to the phased development of national cancer control planning and operational plans for multi-country referrals.
3. **Where possible, take steps to facilitate SIDS' procurement of high-quality vaccines, and cancer technologies for surgery, pathology, imaging, radiotherapy (where appropriate), and systemic therapies (cancer medicines)**. For example, GAVI (the international vaccine alliance) has been instrumental in helping resource-poor countries gain access to affordable vaccines (including HPV vaccines), but could do more to focus on the specific needs of SIDS.
4. **Support workforce development and capacity by co-developing education and training programmes, partnership arrangements, tele-mentoring, and virtual clinics**. Several effective examples of these kinds of interventions exist, for example, the Pacific Island Project of the Royal Australasian College of Surgeons with local Pacific universities and the Pacific Island Surgeons Association have collaborated to increase the number of locally trained surgeons.(cite papers 2 , Ekeroma et al)
5. **Provide technical assistance and research support to SIDS led programs**. There is an urgent need to conduct health systems, economic, pathways and models of care research to inform policy, enhance quality of care and improve outcomes for cancer patients. This also requires capacity building in local data collection; investment in the IARC Caribbean and Pacific Cancer Registry Hubs through the Global Initiative for Cancer Registry Development (GICR) will significantly improve cancer surveillance and monitoring systems in SIDS.
6. **Support SIDS' efforts to reduce importation and consumption of commodities that increase population cancer risk** (tobacco, alcohol, unhealthy food products). In particular, HICs that trade with SIDS should respect these countries' efforts to protect their populations from unhealthy imported products rather than challenging such measures under trade

agreements in order to protect their export markets, as the U.S., Australia and New Zealand have all done in the past.[95,96]

7. **Provide technical and legal support for effective health governance and cancer prevention**, including how Ministries of Health and civil society organisations can strengthen public policies to reduce consumption and manage terms of engagement with commercial industries producing unhealthy commodities (tobacco, alcohol, and processed foods and beverages).

Search strategy and selection criteria

References were identified through searches of PubMed and grey literature with no earliest date specified and up until December 2018, with the search terms "Caribbean", "Pacific", "Small Island Developing States", "Cancer", "SIDS", "regionalisation or regionalism", "workforce", "tobacco control", "NCD control", "surveillance", "research" and "International referrals". Grey literature from key international agencies was searched including from the WHO, World Bank and the UN, and individual country reports (for AIMS SIDS). Additional information was obtained from agendas and reports from key regional health leaders meetings (such as meetings of the Heads of Health, and Ministers of Health of the Pacific and Caribbean), and Government and non-Governmental websites We systematically collected specific information in cancer control activities from Ministry of Health officials and on-the-ground experts from the countries included in this series (see appendix p.1 for list of key informants). Only papers and reports published in English were reviewed. References were included on the basis of originality and relevance to the broad scope of this report.

Author contributions

DSa was the lead author, participated in the concept design, and led the writing of several sections. RD drafted the AIMS SIDS section and accompanying tables and figures. DSp drafted the palliative care section. RS drafted the section on monetary and fiscal policy. DW drafted section textbox 1. CB, SF, and NP drafted the section on regionalism. FB drafted the section on surveillance and research. SH led the section on NCD control. PV, JHe, JHo, SL, and AE contributed to content, participated in the editing and review of the paper. All co-authors reviewed and approved the final submitted version of the manuscript.

Declaration of interests

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Figure

Figure 1. Map of the UN SIDS

Table 1: Small Island Developing States[2]

Caribbean	Pacific	AIMS (Africa, Indian Ocean, Mediterranean and South China Seas)
Anguilla	American Samoa	Bahrain
Antigua and Barbuda	Cook Islands	Cape Verde
Aruba	Federated States of Micronesia	Comoros
Bahamas	Fiji	Guinea-Bissau
Barbados	French Polynesia	Maldives
Belize	Guam	Mauritius
Bermuda	Kiribati	São Tomé and Príncipe
Bonaire, Sint Eustatius and Saba (BES)	Marshall Islands	Seychelles
British Virgin Islands	Nauru	Singapore
Cayman Islands	New Caledonia	
Curaçao	Niue	
Cuba	Northern Mariana Islands	
Dominica	Palau	
Dominican Republic	Papua New Guinea	
Grenada	Samoa	
Guadeloupe	Solomon Islands	
Guyana	Timor-Leste*	
Haiti	Tonga	
Jamaica	Tuvalu	
Martinique	Vanuatu	
Puerto Rico		
Saint Kitts and Nevis		
Saint Lucia		
Saint Vincent and the Grenadines		
Suriname		
Trinidad and Tobago		
Turks and Caicos Islands		
US Virgin Islands		

* In this series Timor-Leste is considered to be an AIMS SIDS (rather than Pacific) due to their political and social ties with the South-East Asian region

Table

Table 2. Characteristics of AIMS SIDS (including Timor-Leste)[21-25]

	Bahrain	Cabo Verde	Comoros	Guinea-Bissau	Maldives	Mauritius	São Tomé and Príncipe	Seychelles	Singapore	Timor-Leste
Estimated population (2017)	1,492,584	546,388	813,912	1,861,283	436,330	1,264,613	204,327	95,843	5,612,253	1,296,311
Income classification	High	Lower middle	Lower middle	Low	Upper middle	Upper middle	Lower middle	High	High	Lower middle
GDP per capita (current US$, 2017)	23,655	3,244	1,312	724	11,151	10,490	1,921	15,629	57,714	2,279
Health expenditure as % GDP (2015)	5·16	4·8	8·0	6·9	11·5	5·5	9·8	3·4	4·3	3·1
Life expectancy at birth (years), total	79·1	73·2	63·9	59·8	78·4	74·8	68·7	73·3	82·9	68·6
Health staff per 10,000 population	9·3 doctors 24·9 nurses	7·7 doctors 10 nurses	1·7 doctors 7 nurses	0·6 doctors 6·9 nurses	10·4 doctors 57·2 nurses	20·2 doctors 32·8 nurses	3·2 doctors	9·5 doctors 44·9 nurses	23·1 doctors 58·3 nurses	6·7 doctors 13·6 nurses
Cancer registration	National high quality PBCR	Registration activity	No data	No data	No data	PBCR	No data	PBCR	National high quality PBCR	No data
National cancer plan (year)	Yes (2010-2020)	Yes (2015)	No	No	No	Yes (2015-2019)	No	Yes	Yes	No
Current NCD plan	Yes	Yes	Yes	No	Yes	No	No	Yes	No	Yes
HBV vaccination coverage (BD, B3, %)	98, 98	96, 96	91 (B3 only)	79 (B3 only)	99, 99	96 (B3 only)	95,93	97 (B3 only)	91, 96	62,92
HPV vaccination on national schedule	No	No	No	No	Yes	Yes	Yes	Yes	Yes	No
Organised national screening programme available	Breast	No	No	No	No	No	No	No	Cervical, Breast, Colorectal	No
Radiology services	Xray, USS, MMG, CT, MRI, PET	Xray, USS, MMG	Xray, USS	Xray, USS, MMG, CT	Xray, USS, MMG, CT, MRI	Xray, USS, MMG, CT, MRI	Xray, USS, CT	Xray, USS, MMG, CT, MRI	Xray, USS, MMG, CT, MRI, PET	Xray, USS, CT

Pathology services	Cytology, histology, IHC	n/a	n/a	n/a	Cytology, histology	Cytology, histology, IHC	n/a	Cytology, histology, IHC	Cytology, histology, IHC	n/a
Publicly available cancer treatment services	Surgery Chemotherapy Radiotherapy	Surgery Chemotherapy	Surgery	Surgery	Surgery Chemotherapy	Surgery Chemotherapy Radiotherapy	Surgery	Surgery Chemotherapy	Surgery Chemotherapy Radiotherapy	Surgery
Oral morphine available in public health sector	Yes	No	No	No	No	Yes	No	Yes	Yes	No

GDP: Gross domestic product

PRCR: Population-based cancer registry

NCD: Non-communicable disease

HBV: Hepatitis B Virus (BD: birth dose, B3: infant doses)

USS: Ultrasound

MMG: Mammography

CT: Computerised tomography

MRI: Magnetic resonance imaging

PET: Positron emission tomography

IHC: Immunohistochemistry

Table

Table 3. Top 5 most commonly diagnosed cancers in men and women for the AIMS SIDS (including Timor-Leste, excluding Seychelles), GLOBOCAN 2018[26]

	Top 5 -male					Top 5 - female				
	1	2	3	4	5	1	2	3	4	5
Bahrain	Colorectum	Lung	Prostate	Bladder	NHL	Breast	Colorectum	Ovary	Uterine	Thyroid
Cape Verde	Prostate	Stomach	Oesophagus	Lung	Liver	Cervix	Breast	Stomach	Colorectum	Liver
Comoros	Prostate	Oesophagus	Liver	NHL	Colorectal	Cervix	Breast	Oesophagus	NHL	Liver
Guinea-Bissau	Liver	Prostate	Stomach	Colorectum	NHL	Cervix	Breast	Liver	Colorectum	Stomach
Maldives	Lung	Colorectum	Nasopharynx	Liver	Prostate	Breast	Cervix	Ovary	Thyroid	Colorectum
Mauritius	Prostate	Lung	Colorectum	Stomach	Bladder	Breast	Colorectum	Cervix	Uterine	Ovary
Sao Tome and Principe	Prostate	Lung	Stomach	Liver	Bladder	Cervix	Breast	Ovary	Lung	Stomach
Singapore	Prostate	Lung	Colorectum	Liver	Kidney	Breast	Colorectum	Lung	Uterine	Ovary
Timor-Leste	Lung	Colorectum	Nasopharynx	Liver	Prostate	Breast	Cervix	Colorectum	Lung	Ovary

Necessary Additional Data

Click here to download Necessary Additional Data: Web appendix.pdf